



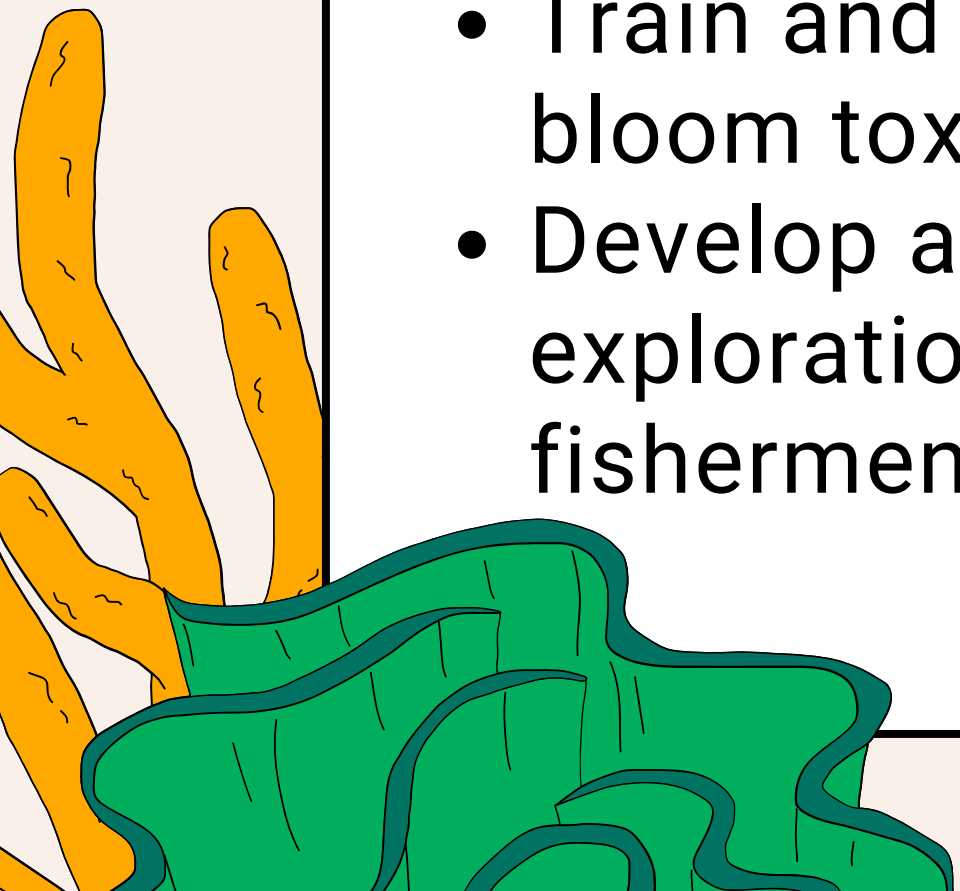
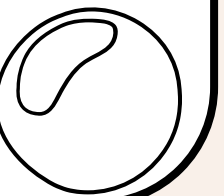
# Harmful Algae Bloom Detection System

**Team: Gradient Descents**

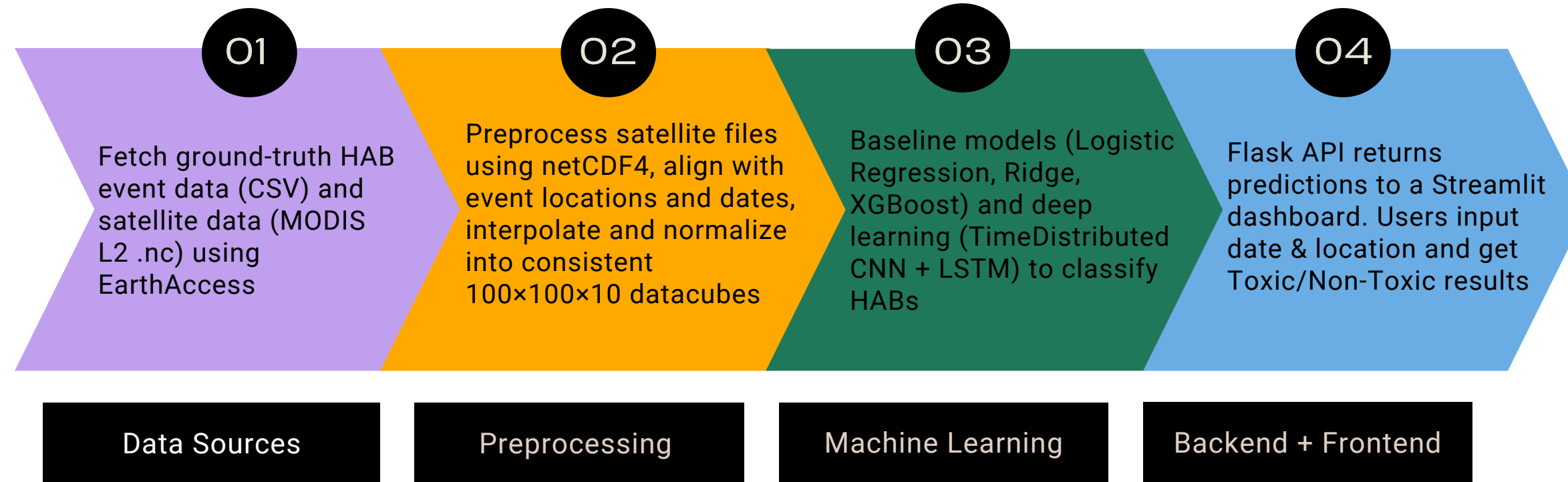


# Objectives

- Analyze and preprocess satellite and ground-truth data to create multimodal spatiotemporal datacubes
- Identify high-risk bloom regions and time periods using historical patterns
- Train and evaluate machine learning models to classify and forecast bloom toxicity
- Develop an interactive web interface for real-time prediction and exploration to be used by Marine Biologists, Enviromental Researchers, fishermen etc.



# System Architecture

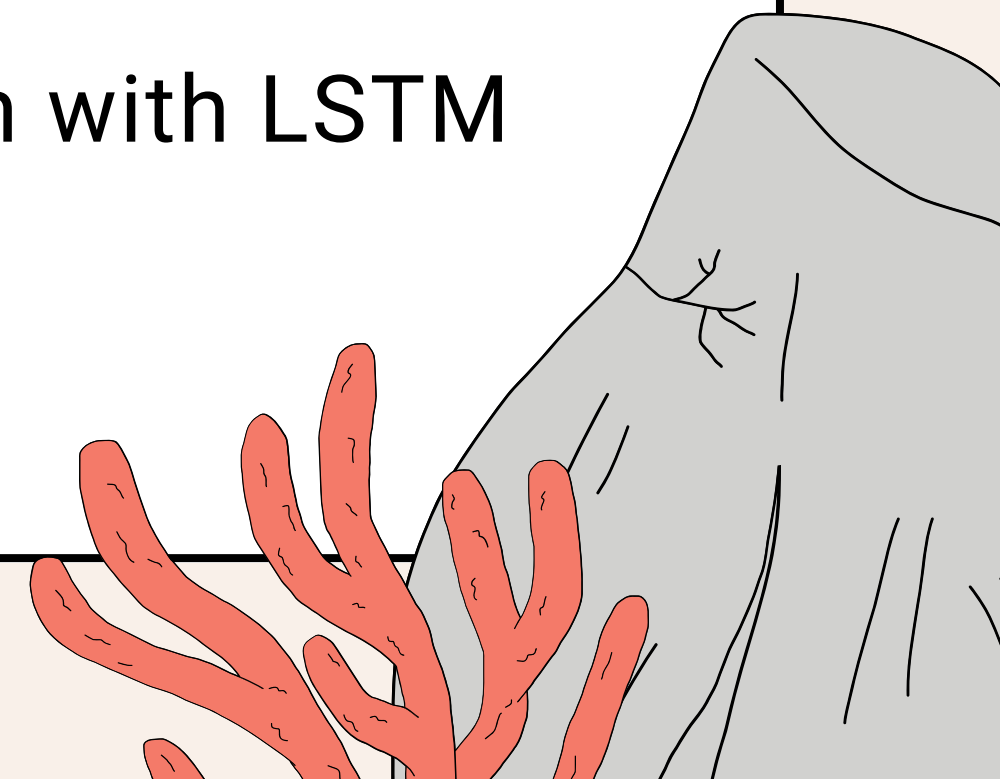


## Additions:

Interactive dashboard connects with Flask API and supports both event-based and manual inputs

# Progress Since Last Presentation

- Expanded dataset from 1k to 3k datacubes
- Expanded datacubes to 7 modalities and 10 days from just Chl-a and 5 days
- Added a converter (datacube -> image generator ) to the data pipeline to match the HabNet type model training
- Tested pre-trained models and then combining them with LSTM layers and tree based models



# Plans for Coming Week<sup>o</sup>

## PIPELINE, BACKEND & FRONTEND

- Add new satellite modalities beyond the current 7 and integrate them into the datacube generation workflow
- Better cloud architecture for deployment in the backend
- Improve the frontend interface to make it intuitive and user-friendly, ensuring that both technical and non-technical users can easily access and understand the predictions

## ML EXPERIMENTS

- From the new dataset of added modalities:
- Begin experiments on forecasting multiple future days using a single model trained on temporal datacubes
  - Train pre-trained models (VGG, ResNet, MobileNet, NASNet) from scratch using image sequences on Colab/Kaggle
  - Evaluate tree-based models on updated datacubes to compare with previous classifiers (Logistic Regression, XGBoost)

# Overall Accomplishments

- Built a data pipeline to fetch and process MODIS-Aqua satellite data into structured datacubes linked to HAB event records
- Trained both classical and deep learning models, including CNN + LSTM, to classify and forecast toxic bloom events
- Deployed a Flask backend for fast model inference based on user input
- Developed a Streamlit dashboard with map-based and manual input for easy access to predictions
- Delivered a complete MVP that connects data, modeling, backend, and user interface into a working HAB detection system



# Review and Tasks Assigned

## CHALLENGE

TASKS	ASSIGNEE
Data collection and preprocessing	Daniel
Machine learning and Model Training	Dharmik, Kruthi
Backend	Sagar, Karthika
Frontend	Roshan

Thank You

